

Bill Crowe 1-301-#27-4100

CONSULTING ENGINEERS

June 20, 1983

Site: West Lake LF
ID # MBD07990932
Break: 3.0
Other: Cu2
com 6-20-83

Mr. John D. Doyle, P.E., Chief
Technical Services Section
Waste Management Program
Mo. DNR
Box 1368
Jefferson City, MO 65102

40249245



SUPERFUND RECORDS

Re: West Lake Landfill, Water Monitoring
Program

Dear Mr. Doyle:

This is in reference to your letter of May 17, 1983 concerning establishment of a groundwater monitoring program for West Lake Landfill.

Rationale

Our experience with sites between Missouri River bluffs has been that the groundwater table (gwt) for the sandy aquifer at depth, especially away from a very narrow band at the toe of the bluffs, is influenced by changing river stages. Observations in wells near the western edge of the West Lake Quarry property also suggest this type interrelationship. Water levels in these wells fluctuate up and down with river stages.

Two general area effects in the alluvial floodplain are dominant for the groundwater regimen. One is the general slope of the Missouri River Valley with flow directions usually aligning with the direction and fall of the valley; the other is the seasonal fluctuation of groundwater elevations in conjunction with rising and falling stages in the Missouri River. The deep Missouri River alluvium does not appear to be stratified or separated into separate aquifers with respect to groundwater movement, but there seems to be communication between the deeper layers containing the coarser sand, gravels, and cobbles, and the finer sandbar-type deposits at higher elevations. This is reasonable, considering the geomorphology of the valley, and especially for this location, for which land ownership records show the Missouri River channel several thousand feet closer to the West Lake property less than 200 years ago. Filling of the old channel was rapid (geologically speaking) and allowed little if any time for deposit of fine-grained parting strata which might act as aquitards indicating two or more thin groundwater aquifers rather than one large thick aquifer.

A second different influence which, if present, is much more localized and is seen during wetter periods when gwt elevations along the toe of bluff are higher than the gwt elevations closer to the river. Groundwater entering from even small upland valleys, especially in the upper portion of the groundwater

MRC0243

aquifer, heads toward the river channel as a raised asymmetrical fan rather than paralleling the valley alignment as a plane.

Because of the very high transmissibility of the Missouri River aquifer, the drop in elevation of the gwt in the direction of flow will not be great. This requires a set of data indicating the groundwater regime be read quickly (a fraction of a day) at as wide a spacing of locations as possible and to accuracies of a small fraction of a foot.

Water surface elevations in a system of wells around the landfill site can be used to indicate groundwater gradients during several months of river stage fluctuations. In addition to reading water levels in the wells two surface water stations just off-site on the river side of the property will also be used. These two water stations are results of blowouts during high river stages and are interconnected to the sands in the Missouri River alluvium.

In addition to water levels in the new wells, reading water levels in the old wells should be continued until sufficient data is developed to verify that the rise and fall of gwt elevation in the wells is relatively consistent with the other wells. Reading water levels in the old wells along with the new wells should be continued until sufficient data is developed to relatively consistent rising and falling of gwt elevation in the wells with fluctuation of river stages or use of an old well will be discontinued in this program.

Procedure

Groundwater Table Measurements:

A set of gwt elevations will consist of reading all available wells or gages on the same day in one continuous operation. Staff gages will be installed along the sides of the two water areas off-site just north of the landfill property, one on each side of St. Charles Rock Rd. Water depth in the wells will be measured by using a commercially available Johnson Water Marker (see Attachment No. 1, Johnson Bulletin WM375). This measuring device has been in use for the past several years. Elevations of the tops of wells will be tied into benchmarks (msl, USGS). The river stage at St. Charles gage on that day will be made part of the record.

Program Phases

Phase I is the initial phase for developing the groundwater gradient information. It is to indicate if the groundwater gradient (flow direction) around the site is simply parallel to the bluffline or tends to be somewhat diagonal toward the river channel. If several sets of observation indicate irregular piezometric surfaces, Phase II is indicated with additional wells installed. For a Phase I operation several other locations for reading water levels will be needed in addition to the existing monitoring wells on-site and the two water surface points just north of the property. The addition of 5 new wells should suffice (see Attachment No. 2 for well locations).

PHASE I

1. Install 5 wells N-1, N-2, N-3, N-4 and N-5 (see Attachment No. 3 for installation of wells).

2. Record water level readings at 5 new wells, two surface monitoring points, and old landfill monitoring wells. Record river stage and rainfall (summarize rainfall one week between recording dates from Lambert Field gage).

3. Take readings every two weeks initially, with frequency to decrease after one cycle or 6 months. Readings will be taken more frequently when river stage changes two feet or more per day.

4. Continue recordkeeping for another cycle.

(a) Initial investigation will require at least two cycles be observed.

(b) Summarize and reevaluate after each cycle.

Comments, Phase I

As indicated by Geological Engineering, DNR, the specific planned location of a well is not too sensitive; where it is actually built is much more important. After the well is installed it will be located and tied into the site plan by field survey. Drilling logs of new wells will indicate the stratification.

It is suggested that wells in N-1 and N-2 be installed up-gradient in the alluvial valley. Existing wells HL-1, HL-2, and HL-3 are up-gradient from the landfill. Care must be taken to ensure that bedrock is at least 80 feet below the surface where the wells are located. This can be accomplished by initially drilling down into the alluvium the 80-foot minimum depth before installing wells.

Well N-3 can be installed on the west corner of the landfill property, while N-4 can be installed on the north end of the property adjacent to surface point S-1. Well N-5 can be installed on the north side of the site, along the side of St. Charles Rock Rd.

Wells N-1, N-3, N-4, and N-5 to be 40 feet deep (see drawing on monitoring wells for details). Well N-2 will be 30 feet deep. A third well could be installed here 20 feet deep, if needed, to provide a cluster well system of three wells 20 feet, 30 feet, and 40 feet deep with each well monitoring the lower 10 feet. Cluster wells permit measuring several piezometric surface elevations in different elevations of the groundwater at one location and can be used to ascertain if a perched water table is present at its location.

PHASE II

1. Install additional well(s) as required. Number and location of wells to be determined as Phase I is concluded.

2. Take readings for two more cycles.
3. Summarize results for apparent groundwater gradient.

PHASE III

1. Make evaluation of all wells to determine wells that will be included in the continuing monitoring program.
2. Take initial water quality samples for background analyses on the new wells designated to become part of the new monitoring program. Also, take water samples for regular quarterly analysis from all old wells which will be included in the new monitoring program.
3. Take water level readings in wells and two surface points on a regular basis as per future agreement with Mo. DNR.

Proposed Timetable

- Phase I:
1. Installation of initial group of 5 wells - 1 month.
 2. Check and record water levels - 6 months.
 3. Review and summarize results and discuss with Mo. DNR.

- Phase II:
4. Install additional wells, as required, - 1 month.
 5. Continue recording water levels - 6 to 12 months.
 6. Summarize results for determination of groundwater gradient and report same to Mo. DNR.

- Phase III:
7. Finalize on number of wells and install additional wells for monitoring leachate, if required - 1 month.
 8. Take initial water samples for background analysis on wells designated for monitoring (these wells will go on the quarterly monitoring report to DNR) - 1 month.
 9. Review results of all wells, old and new, for final recommendations to Mo. DNR to establish a comprehensive monitoring program.

We await your permission to begin Phase I. If there are any questions, please call.

Very truly yours,


DAVID E. MURRAY

Encl.
DEM/rs
cc: W.J. McCullough
H.J. Williams
Mo. DNR (St. Louis)

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REPL. PROBE ONLY	18.80	2300160

INSTALLATION OF NEW MONITORING WELLS AT WEST LAKE LANDFILL - PHASE I

June 1983

The proposed locations of the new monitoring wells are shown on the attached plan, Attachment No. 2. Wells N-1, N-3, N-4, and N-5 will be 40 feet deep. Well N-2 will be 30 feet deep. The bottom of each well will be slotted pipe or well screen (see schedule for details). Sand will be placed around the well screen and up about two feet above the well screen where there will be a bentonite seal about two feet thick.

Split-spoon samples will be taken every 2-1/2 feet down to the groundwater table and the groundwater elevation will be measured.

The hole will be drilled with a truck-mounted 8-inch hollow stem auger, down to the groundwater table. Sectional flush joint steel casing will then be set and drilled with roller bit. A 4-inch diameter Schedule 40 PVC pipe with a minimum of 10 feet of slotted pipe or well screen at the bottom will be placed inside the casing with spacers to keep the PVC pipe centered. Dry sand will then be placed to a level about two feet above the slotted pipe or well screen. The steel casing will be extracted gradually, as more sand is placed in the hole, to fill the space between the well screen and casing. Care will be exercised to maintain top of sand above bottom of casing. The 5- and 10-foot lengths of casing will be removed as the hole is filled.

After the 12 feet of sand is placed in the bottom of the well, about two feet of bentonite pellets will be placed in the well and packed to form a seal. If the bentonite is to be placed above the groundwater table, granular bentonite will be used. As the casing sections are gradually pulled out, above the bentonite seal, a small diameter grout pipe will continue carrying the pumped cement-bentonite grout mix into the hole until it is completely filled to ground level. It is proposed to use a grout mixture consisting of 45% cement, 45% sand, and 10% bentonite pellets with some aluminum powder mixture to speed up the mortar setting under water.

The proposed new monitoring wells, along with existing wells, should provide an adequate monitoring system for the West Lake Landfill.

WEST LAKE LANDFILL

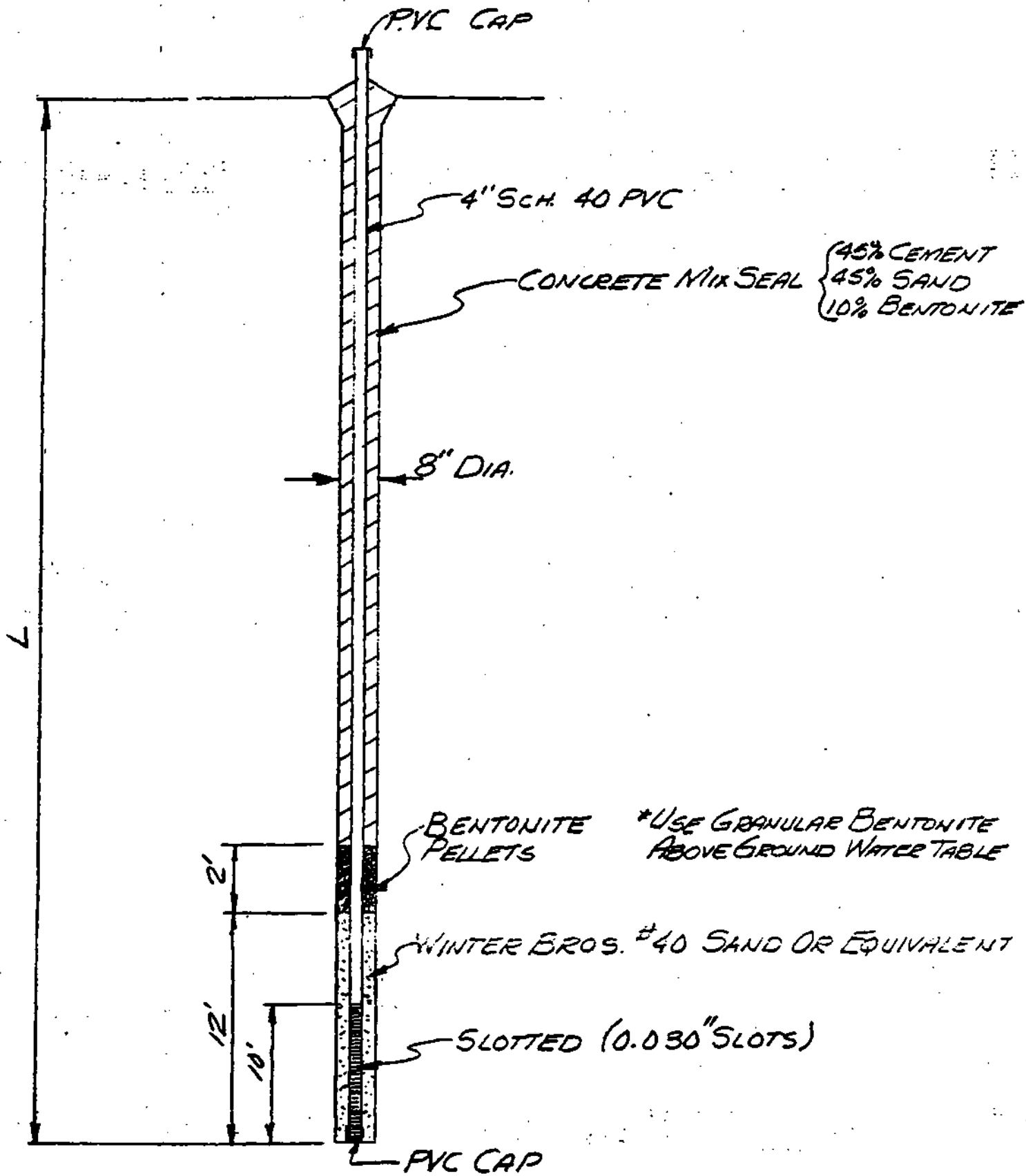
Schedule for New Monitoring Wells

Phase I

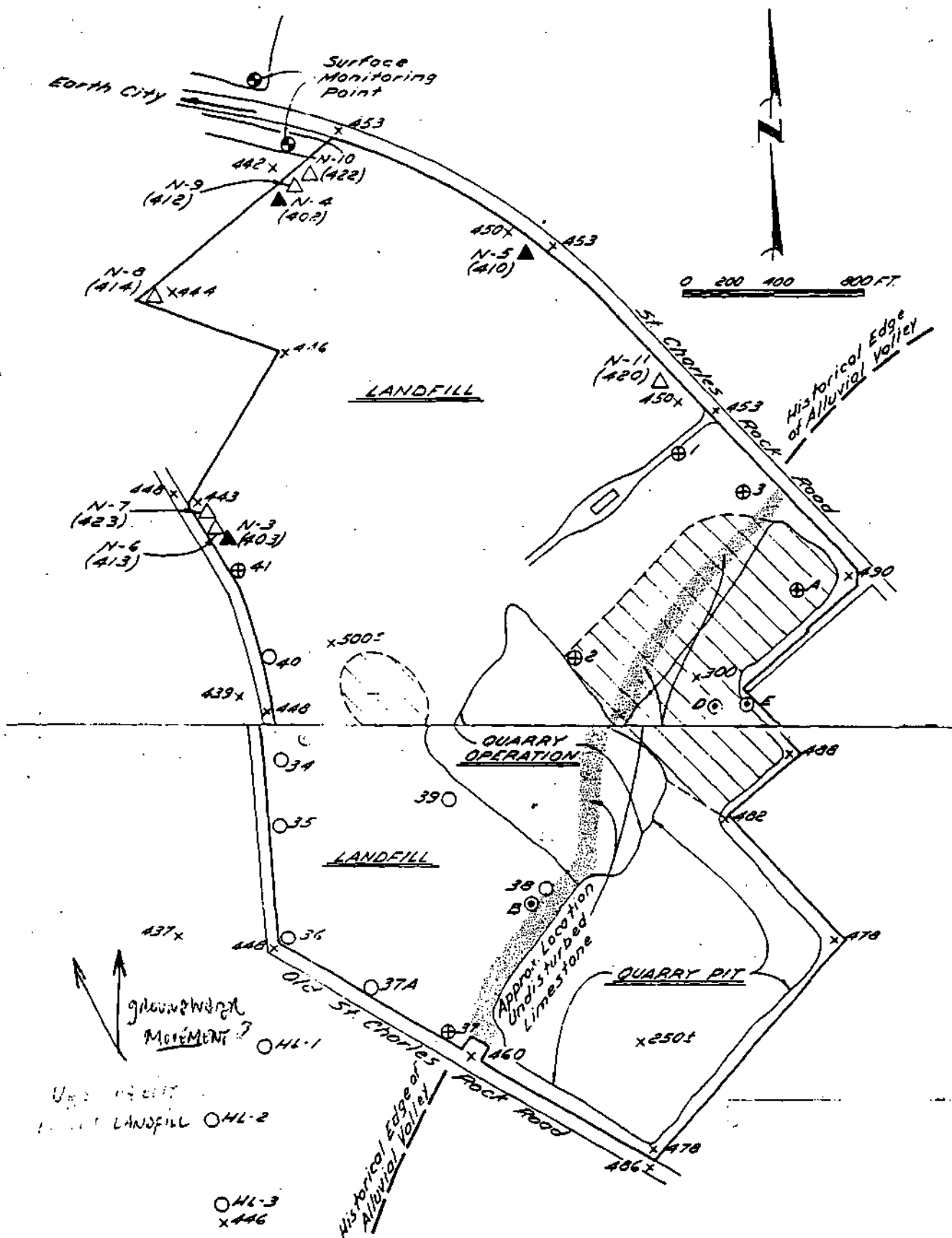
June 1983

	<u>Well Depth</u>	<u>Length of Well Screen</u>	<u>Bottom Elev. of Well*</u>
N-1	40'	10'	408
N-2	30'	10'	418
N-3	40'	10'	403
N-4	40'	10'	402
N-5	40'	10'	410

*Elevation to be determined by field survey.



WEST LAKE LANDFILL INC.
MONITORING WELLS
REITZ & JENS, INC.
MARCH, 1983



x448
N-1 (408) N-2 (418)

- Active Landfill
- Collection Well
- Monitoring Well
- Damaged Well
- Proposed Monitoring Well (Phase I)
- Proposed Monitoring Well (Phase II)
- x440 Ground Elevation
- (407) Antom of Well Elevation

WEST LAKE LANDFILL

WELL LOCATION MAP